

### **AMENDMENTS TO THE CLAIMS**

**1. (Currently amended)** A probe for detection and quantification of a lipid second messenger, which comprises:

a polypeptide which can specifically bind the lipid second messenger,

~~two chromophores respectively having different fluorescence wavelengths, wherein each of the chromophores is linked to each end of the polypeptide through a rigid linker sequence; and~~  
~~— a membrane localization sequence linked to one of the chromophores through a rigid linker sequence~~  
a first chromophore linked to one end of the polypeptide through a rigid linker sequence;

a second chromophore linked to another end of the polypeptide through a second rigid linker sequence, wherein the second chromophore has a different fluorescence wavelength from the first chromophore, and the second rigid linker sequence has a flexible site acting as a hinge;  
and

a membrane localization sequence linked to the second chromophore through a third rigid linker sequence, wherein when the polypeptide is bound to the lipid second messenger, the first and second chromophores are capable of Fluorescence Resonance Energy Transfer (FRET).

**2. (Previously presented)** The probe for detection and quantification of a lipid second messenger of claim 1, wherein the polypeptide which can specifically bind the lipid second messenger is a lipid second messenger-binding protein.

**3. (Currently amended)** The probe for detection and quantification of a lipid second messenger of claim 2, wherein the lipid second messenger-binding protein is a pleckstrin homology domain from General Receptor for Phosphoinositides-1 (GRP1).

**4. (Previously presented)** The probe for detection and quantification of a lipid second messenger of claim 1, wherein the chromophores are a cyan fluorescent protein linked to N-terminal end of the polypeptide and a yellow fluorescent protein linked to C-terminal end of the polypeptide.

**5. (Currently amended)** The probe for detection and quantification of a lipid second messenger of claim 1, wherein the first, second and third linker sequence ~~sequence is~~ sequences comprise a rigid  $\alpha$ -helix linker consisting of repeated sequences of SEQ ID NO: 1.

**6. (Previously presented)** The probe for detection and quantification of a lipid second messenger of claim 1, wherein at least one linker sequence has a single di-glycine motif.

**7. (Previously presented)** The probe for detection and quantification of a lipid second messenger of claim 1, wherein the membrane localization sequence is a lipidized sequence or a transmembrane sequence.

**8. (Withdrawn)** A method for detecting and quantifying a lipid second messenger, which comprises:

co-existing the probe for detection and quantification of a lipid second messenger of claim 1 with the lipid second messenger; and  
measuring changes in fluorescence spectra.

**9. (Withdrawn)** The method for detecting and quantifying a lipid second messenger according to claim 8, which comprises:

introducing a polynucleotide to express the probe for detection and quantification of a lipid second messenger into cells; and  
co-existing the probe with the lipid second messenger.

**10. (Withdrawn)** The method for detecting and quantifying a lipid second messenger according to claim 8, which comprises:

introducing a polynucleotide to express the probe for detection and quantification of a lipid second messenger into a non-human totipotent cell; and  
ontogenizing the cell to non-human animal, thereby co-existing the probe with the lipid

second messenger in all cells of the animal or offspring animal.

**11. (Withdrawn)** The method for detecting and quantifying a lipid second messenger according to claim 9, wherein the probe for detection and quantification of a lipid second messenger is fixed on membrane in the cells, and the lipid second messenger produced in the membrane is detected and quantified.

**12. (Withdrawn)** A non-human animal or offspring animal thereof, which is obtained by:  
introducing a polynucleotide to express the probe for detection and quantification of a lipid second messenger of claim 1 into a non-human totipotent cell; and  
ontogenizing the cell to the non-human animal.

**13. (Withdrawn)** A method for screening a substance for quantifying a lipid second messenger, in the cells of the non-human animal or offspring animal thereof of claim 12, which comprise introducing a test sample into the non-human animal or the offspring animal thereof.

**14. (Withdrawn)** The method for detecting and quantifying a lipid second messenger according to claim 10, wherein the probe for detection and quantification of a lipid second messenger is fixed on membrane in the cells, and the lipid second messenger produced in the membrane is detected and quantified.